Novel technology improves protection for vulnerable road users

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EU-funded researchers have studied and piloted a variety of Intelligent Transport Systems (ITS) to ascertain which will best improve the safety, comfort and mobility for vulnerable road users (VRUs).

The EU has a target of halving road fatalities by 2020 and figures released by the European Commission show that there were 26 000 fatalities and 135 000 serious injuries on EU roads in 2015, with a combined cost of around EUR 100 billion (rehabilitation, healthcare, material damages, etc.).

Between 2000 and 2012, fatalities among car occupants were reduced by 50% but similar reductions were not experienced by Vulnerable Road Users (VRUs), with fatalities amongst pedestrians reduced by 34 %, cyclists 31 %, and motorcyclists 17 %. Taken together, VRUs account for 68 % of the road fatalities in urban areas. Indeed, incidents involving VRUs are one of the reasons cited for the slowdown in EU road safety between 2015 and 2014.

The three-year VRUITS project acknowledges that the Intelligent Transport System (ITS) approach to traffic management has undoubtedly contributed to the reduction in car fatalities by equipping vehicles and infrastructure with additional technology. However, the researchers argue it has given less emphasis to the safety, comfort and mobility needs of VRUs.

The project sought to redress this balance by analysing different ITS,

suggesting VRU-centric practices, which were then field tested and piloted. This enabled the researchers to make evidence-based recommendations for future policy and industrial development. Contributing factors such as market readiness, cost-benefit analysis, currently available infrastructure and societal impact were taken into account when making these recommendations.

Field testing

For infrastructure based ITS, the project looked at Intelligent Pedestrian Traffic Signal (IPT), Crossing Adaptive Lighting (CAL) and Information on Vacancy of Bicycle Racks (IVB). With vehicle based systems it focused on Blind Spot Detection (BSD), Pedestrian and Cyclist Detection System + Emergency Braking (PCDS+EBR) and VRU Beacon System (VBS). Finally, for user-centric systems it concentrated on Powered Two Wheeled on-coming Vehicle Information System (PTW2V), Bicycle to Vehicle Communications (B2V), Green Wave for Cyclists (GWC) and Intersection Safety (INS).

Field trials of recommended practices were held in the Netherlands and Spain. In Valladolid, Spain, system tests were conducted into improvements to pedestrian mobility by sensor controlled traffic lights and to safety through increased visibility at zebra crossing. The trial found that as a result of the modifications 5 % fewer pedestrians crossed the road on a red light and pedestrians experienced 20 % less waiting time.

The pilot study in Alcalá de Henares looked at intersection safety by using pedestrian detectors and driver notification, finding that the system held a lot of versatility but also the potential to be quite expensive to set-up, depending on the existing infrastructure. In Helmond in the Netherlands, researchers also looked at intersection safety but this time for cyclists by piloting a system which warned both car drivers and

cyclists of potential collision danger, as well as instituting automatic car braking.

Running these pilots enabled a more advanced technical understanding of the relative costs and benefits of each of the systems. Overall, the study of the 10 systems determined that seven returned benefits that outweighed the cost of implementation, improving the safety, mobility and comfort of VRUs. The study found that Pedestrian and Cyclist Detection System and Emergency Braking holds promise for the improvement of safety for VRUs but the researchers also acknowledge limitations in research methodology with the difficulty in designing tests which accurately replicate high risk scenarios. Therefore, the researchers suggest better accident data as one way towards creating optimum systems, as well as a system-wide rather than individual component strategy.

Policy recommendations

The project also made a series of policy and industrial development recommendations. From a design stand-point they recommend the need for improved VRU detection accuracy and interfaces with designs optemised for users. Additionally, they call for devices that can adapt to environmental conditions and are enabled with multiple, cooperative functions. They also underline the need for better prediction of road user behaviour, proper procedures for data usage, standardised systems and legislation enforcement where necessary.

These recommendations come at a timely juncture. Connected and automated driving (C-ITS) has been cited as a key part of the EU's strategy to meet the 2020 50 % reduction of road fatalities and the Commission will develop its ITS deployment master plan in the second half of 2016.

More information: For more information please see the VRUITS project website: www.vruits.eu/

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